

(19) World Intellectual Property Organization  
International Bureau



(43) International Publication Date  
14 July 2005 (14.07.2005)

PCT

(10) International Publication Number  
**WO 2005/064399 A3**

(51) International Patent Classification:

G03F 1/14 (2006.01) G02B 26/02 (2006.01)  
G03F 7/20 (2006.01)

(21) International Application Number:

PCT/IB2004/052620

(22) International Filing Date:

1 December 2004 (01.12.2004)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

03104914.1 22 December 2003 (22.12.2003) EP

(71) Applicant (for all designated States except US): **KONINKLUKE PHILIPS ELECTRONICS N.V.** [NL/NL];  
Groenewoudseweg 1, NL-5621 BA Eindhoven (NL).

(72) Inventors; and

(75) Inventors/Applicants (for US only): **DIRKSEN, Peter** [NL/NL]; c/o Prof. Holstlaan 6, NL-5656 AA Eindhoven (NL). **HAYES, Robert, A.** [AU/NL]; c/o Prof. Holstlaan

6, NL-5656 AA Eindhoven (NL). **JUFFERMANS, Casparus, A., H.** [NL/NL]; c/o Prof. Holstlaan 6, NL-5656 AA Eindhoven (NL). **STEFFEN, Thomas** [DE/NL]; c/o Prof. Holstlaan 6, NL-5656 AA Eindhoven (NL).

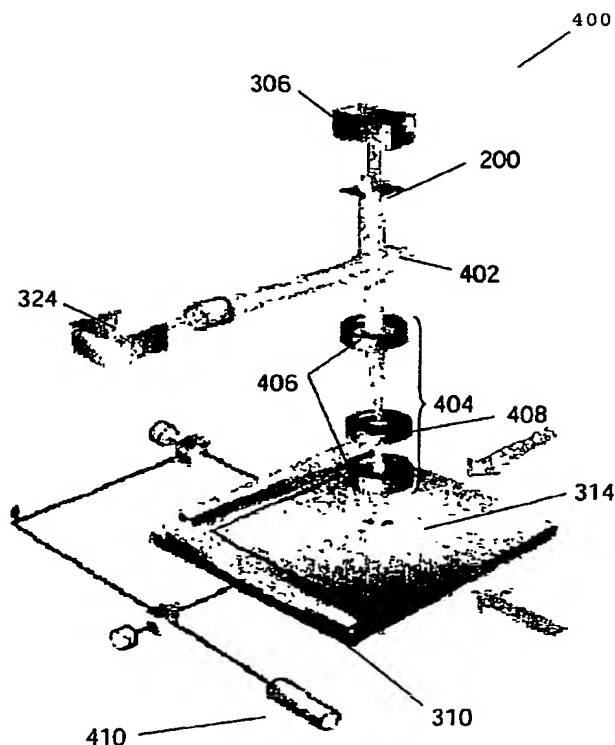
(74) Agents: **ELEVELD, Koop, J. et al.**; Prof. Holstlaan 6, NL-5656 AA Eindhoven (NL).

(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM),

[Continued on next page]

(54) Title: LITHOGRAPHY SYSTEM USING A PROGRAMMABLE ELECTRO-WETTING MASK



(57) Abstract: A maskless lithography system is described having a programmable mask to allow performing several lithographic steps using the same mask. In every lithographic step, the corresponding pattern is obtained by providing a digital pattern to the programmable mask. The programmable mask includes an array of pixels which are based on the electro-wetting principle. According to this principle, every pixel has a transparent reservoir containing a first, non-polar, non-transparent fluid and a second, polar, transparent fluid which are immiscible. Applying a field to the reservoir allows to displace the fluids with respect to each other. This allows to make the pixel either transparent or non-transparent. This lithographic programmable mask allows high resolution and fast setting and refreshing. A corresponding method for performing maskless optical lithography also is described.

BEST AVAILABLE COPY

WO 2005/064399 A3



European (AT, BE, BG, CH, CY, CZ, DE, **DK**, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, MC, NL, PL, PT, **RO**, SE, SI, SK, TR), OAPI (BF, **BJ**, CF, CG, CI, CM, GA, GN, GQ, GW, ML, **MR**, NE, SN, TD, TG).

BG, CH, CY, CZ, DE, **DK**, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG)

**Declaration under Rule 4.17:**

— as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(U)) for the following designations AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, **DK**, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, UZ, VC, VN, YU, ZA, ZM, ZW, ARIPO patent (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE,

**Published:**

— with international search report  
— before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments

**(88) Date of publication of the international search report:**

30 March 2006

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.